

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



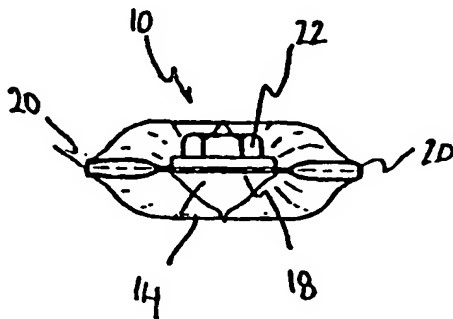
(43) International Publication Date
12 April 2001 (12.04.2001)

PCT

(10) International Publication Number
WO 01/24955 A1

- (51) International Patent Classification⁷: B21D 41/04, 47/00, 49/00
- (21) International Application Number: PCT/AU00/01209
- (22) International Filing Date: 5 October 2000 (05.10.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
PQ 3258 5 October 1999 (05.10.1999) AU
- (71) Applicant (for all designated States except US): WEEKS
PEACOCK QUALITY HOMES PTY LTD [AU/AU];
712-714 South Road, Glandore, S.A. 5037 (AU).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): WEEKS, Kevin,
William [AU/AU]; 712-714 South Road, Glandore, S.A.
5037 (AU).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:
— With international search report.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD OF CRUSHING A TUBE



(57) Abstract: A tube (10) includes a central crushed region (18) for receiving a fixing element (22) and lateral non-crushed regions (20) disposed either side of the crushed region (18) which provide additional structural strength to the tube.

WO 01/24955 A1

BEST AVAILABLE COPY

"METHOD OF CRUSHING A TUBE"

TECHNICAL FIELD

5 This invention relates to a method of crushing a tube.

The invention has particular, but not exclusive, application in preparing the end of a tube for connection with another member via a conventional fixing element such as a bolt.

10 The invention has particular utility in crushing the end of a web. As used herein "web" is used to refer to a strut or bracing element which extends between the upper and lower chord of a roof truss.

DISCLOSURE OF INVENTION

15 According to one aspect the invention resides in a method of crushing a tube, the method including:-

 pressing together opposed portions of the tube such that the opposed portions abut to define a land which is adapted to receive a fixing element, wherein opposed lateral portions of the tube adjacent the land do not abut but
20 rather define sub-tubes which straddle the land and which extend lengthwise of the tube.

 According to another aspect the invention resides in a method of forming a flattened region in a tube, the method including pressing together opposed portions of the tube, whilst not pressing together lateral opposed portions of the
25 tube.

 According to another aspect the invention resides in a method of forming a flattened region in a tube, the method including selectively pinching opposed portions of the tube together such that the opposed portions of the tubes abut at a central location and such that lateral sub-tubes are defined which straddle the
30 pinched portion.

 According to another aspect the invention resides in a method of forming a land on a tube, the method including:-

compressing opposed peripheral portions into abutment to define the land, such that lateral ribs extend along either side of the land, the ribs being formed by the portions of the tube adjacent the abutting portions which define the land.

5 According to another aspect the invention resides in a method of crushing a tube, the method including:-

crushing the tube between a pair of opposed crush members, at least one of the crush members being substantially narrower than the corresponding dimension of the tube and engaging the tube in a substantially central location
10 whereby a central crushed region is defined between a pair of lateral non-crushed regions, said crushed region being adapted to receive a fixing element.

According to another aspect the invention resides in a tube including a crushed region wherein opposed portions of the tube have been crushed together to abut and define a land which is adapted to receive a fixing element,
15 the tube further including longitudinally extending non-crushed regions located laterally either side of the crushed region.

According to another aspect the invention resides in a tube including:-

a land at an end of the tube formed by compressing opposed peripheral portions of the tube into abutment, and
20 ribs extending along either side of the land and formed by the portions of the tubular member adjacent the abutting peripheral portions.

BRIEF DESCRIPTION OF DRAWINGS

25 Reference will now be made to the accompanying Figures which illustrate preferred embodiment of the invention and in which:-

FIG 1 is a plan view of a tube having a crushed or flattened end;

FIG 2 is a frontal elevation of the tube of FIG 1;

FIG 3 is a right side elevation of the tube of FIG 1 with a bolt head present;
30

FIG 4 is a right side elevation of the tube of FIG 1 with the bolt head absent; and

FIG 5 is a right side elevation of the tube of FIG 1 with the nut and bolt present and with the tube fastened to a planer surface.

BEST MODE

5

Referring firstly to FIG 1, there is shown in plan a metallic tube 10. Tube 10 may be, for example, a web which in use extends between the upper and lower chords of a roof truss.

10 Tube 10 is originally formed from a planer sheet of material which is folded about a longitudinal axis to define the tube with an overlapping longitudinal seam 12 as best shown in FIG 2.

The seam may be welded, riveted, glued or fixed by any known means. However, the preferred embodiment utilises an integral stitching method which swages together material in the overlapping seam region.

15 With reference to FIG 2, it will be noted that the end of the tube is tapered in frontal elevation. Furthermore, referring to FIG 1, a substantially triangular region 14 is more aggressively tapered and is pressed together into an abutting relationship adjacent the end of the tube.

20 Referring to FIG 3, it will be noted that in a central region 18 the opposed peripheral portions of the tube are crushed together so as to be abutting and planer. In contrast, open sections 20 are defined either side of the central crushed region 18. Each of the open sections 20 defines a sub-tube or rib which extends longitudinally of the tube 10 either side of the central crushed region 18.

25 The central crushed region 18 is adapted to receive a fixing element by virtue of one or more punched holes 16. As shown in FIG 3, the punched hole 16 receives a fixing element in the form of a nut and bolt arrangement 22.

The central crushed region 18 provides a flattened land which is adapted to receive a conventional fixing element such as nut and bolt arrangement 22.
30 In contrast, the lateral non-crushed regions 20 provide additional structural strength as compared to a tube in which the entire end of the tube is pinched into an abutting relationship.

Referring now to FIG 5, it will be noted that when the tube is fastened a planer surface (eg the upper or lower chord of a truss), the end of the tube is deformed in that ribs or sub-tubes 20 are deformed upwardly in a wing-like manner by virtue of the engagement of the underside of the tube with the planer surface of the chord. It will be appreciated that upward wing-like deformation of the sub-tubes 20 occurs under load, ie. the bolt is under tension as it is tightened. This results in a secure joint between the tube and chord.

It will, of course, be realised that the above has been given by way of illustrative example of the invention. Any variations, modifications, or omissions, as would be apparent to persons skilled in the art, are deemed to fall within the broad scope of this invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A method of crushing a tube, the method including:-
pressing together opposed portions of the tube such that the opposed
5 portions abut to define a land which is adapted to receive a fixing element,
wherein opposed lateral portions of the tube adjacent the land do not abut but
rather define sub-tubes which straddle the land and which extend lengthwise of
the tube.
- 10 2. A method of forming a flattened region in a tube, the method including
pressing together opposed portions of the tube, whilst not pressing together
lateral opposed portions of the tube.
- 15 3. A method of forming a flattened region in a tube, the method including
selectively pinching opposed portions of the tube together such that the
opposed portions of the tubes abut at a central location and such that lateral
sub-tubes are defined which straddle the pinched portion.
- 20 4. A method of forming a land on a tube, the method including:-
compressing opposed peripheral portions into abutment to define the
land, such that lateral ribs extend along either side of the land, the ribs being
formed by the portions of the tube adjacent the abutting portions which define
the land.
- 25 5. A method of crushing a tube, the method including:-
crushing the tube between a pair of opposed crush members, at least
one of the crush members being substantially narrower than the corresponding
dimension of the tube and engaging the tube in a substantially central location
whereby a central crushed region is defined between a pair of lateral non-
30 crushed regions, said crushed region being adapted to receive a fixing element.
6. A tube formed according to the method of any one of claims 1 to 5.

7. A tube including a crushed region wherein opposed portions of the tube have been crushed together to abut and define a land which is adapted to receive a fixing element, the tube further including longitudinally extending non-crushed regions located laterally either side of the crushed region.

8. A tube including:-

a land at an end of the tube formed by compressing opposed peripheral portions of the tube into abutment, and

10 ribs extending along either side of the land and formed by the portions of the tubular member adjacent the abutting peripheral portions.

1/2

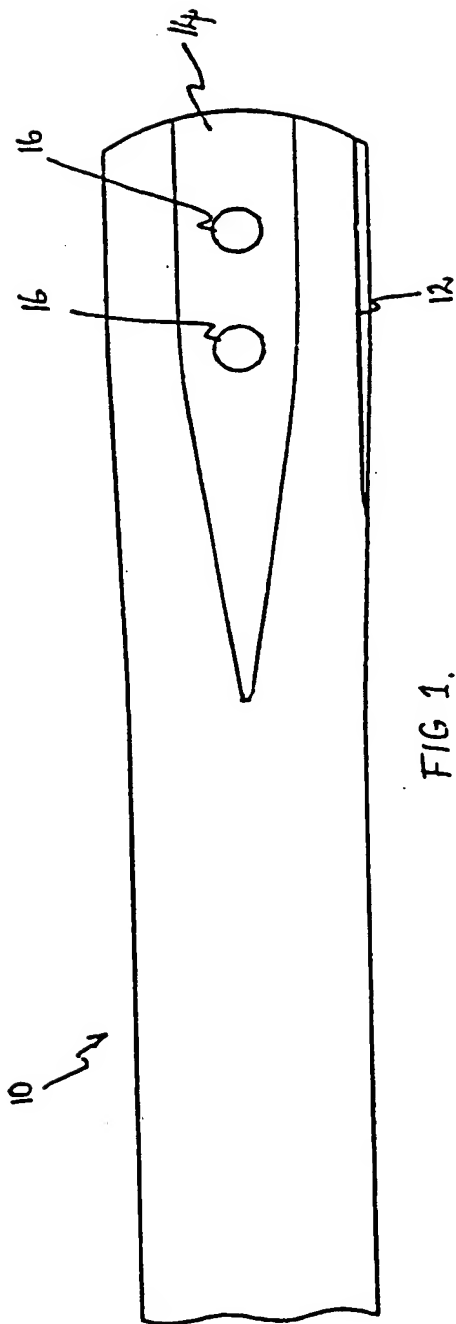


FIG 1.

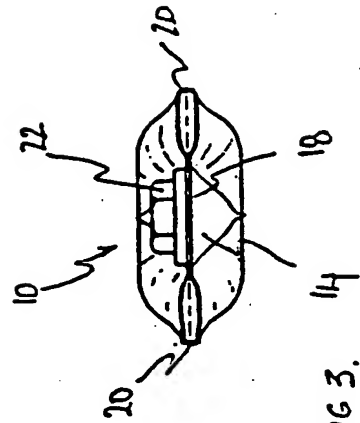


FIG 3.

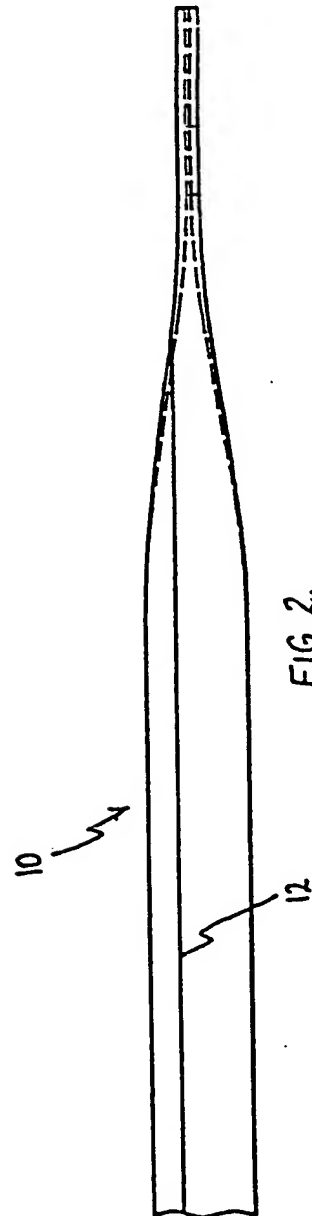


FIG 2.

2/2

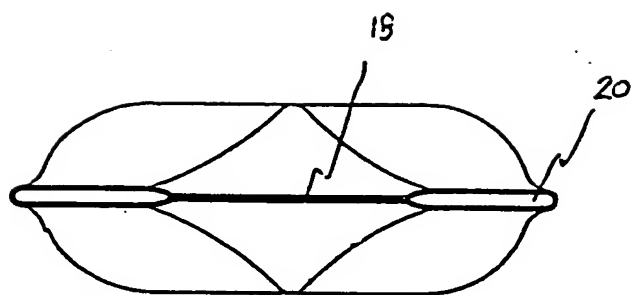


FIG 4.

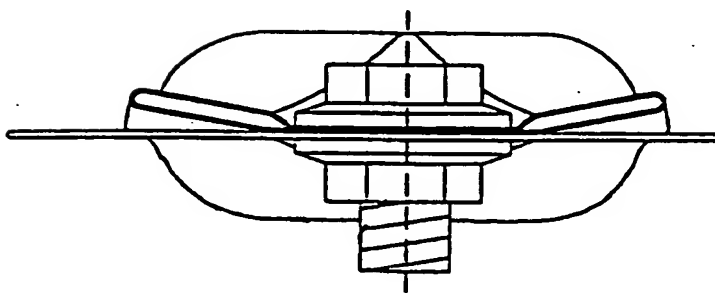


FIG 5.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 00/01209

A. CLASSIFICATION OF SUBJECT MATTER				
Int Cl ⁷ : B21D 41/04, 47/00, 49/00				
According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED				
Minimum documentation searched (classification system followed by classification symbols) IPC: E04B 1/19, B21D 41/04, 47/00, 49/00				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC as above				
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI: flat + crush + deform + tube + crush + press + opposed				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
A	AU 20545/95 A (MUNERETTO) 14 December 1995 Figure 5	1-8		
A	EP 522282 A (BOGEL) 13 January 1993 Entire document	1-8		
A	EP 23721 A (BUHEL) 14 February 1981 Entire document	1-8		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex				
<p>* Special categories of cited documents:</p> <table style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; vertical-align: top;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p> </td> </tr> </table>			<p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>
<p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>			
Date of the actual completion of the international search 07 December 2000		Date of mailing of the international search report 14 DEC 2000		
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No.: (02) 6285 3929		Authorized officer D.G. FRY Telephone No.: (02) 6283 2130		

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 00/01209

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 402175 A (MOONEY) 12 December 1990 Entire document	1-8

Information on patent family members

PCT/AU 00/01209

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

END OF ANNEX

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.

THIS PAGE BLANK (USPTO)